FIG.1

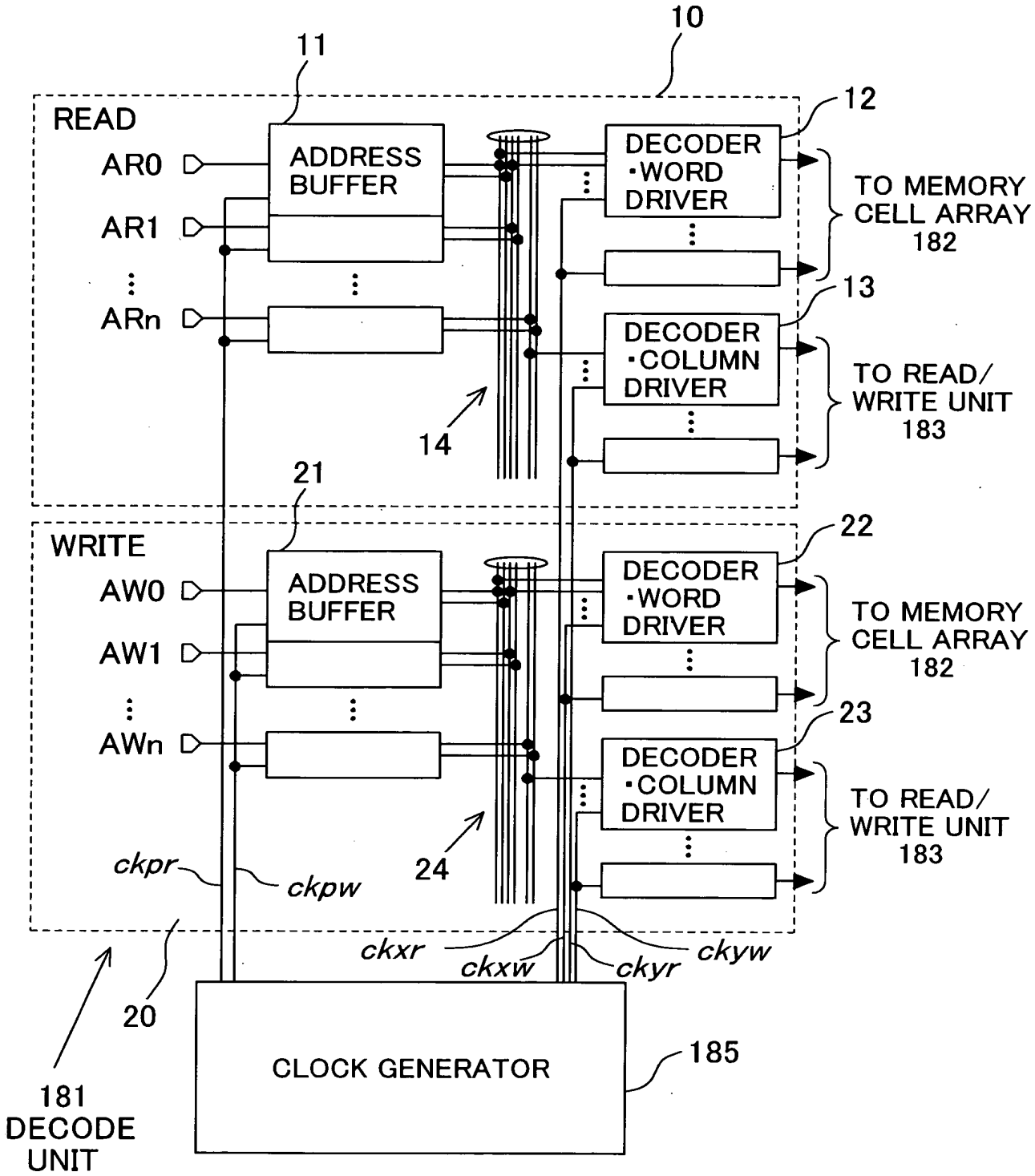

10
11
READ
AR0
AR1
ARn
ADDRESS BUFFER
12
DECODER ·WORD DRIVER
TO MEMORY CELL ARRAY 182
13
DECODER ·COLUMN DRIVER
TO READ/ WRITE UNIT 183
14
21
WRITE
AW0
AW1
AWn
ADDRESS BUFFER
22
DECODER ·WORD DRIVER
TO MEMORY CELL ARRAY 182
23
DECODER ·COLUMN DRIVER
TO READ/ WRITE UNIT 183
24
ckpr
ckpw
ckxr
ckxw
ckyr
ckyw
20
CLOCK GENERATOR
185
181
DECODE UNIT

FIG.2

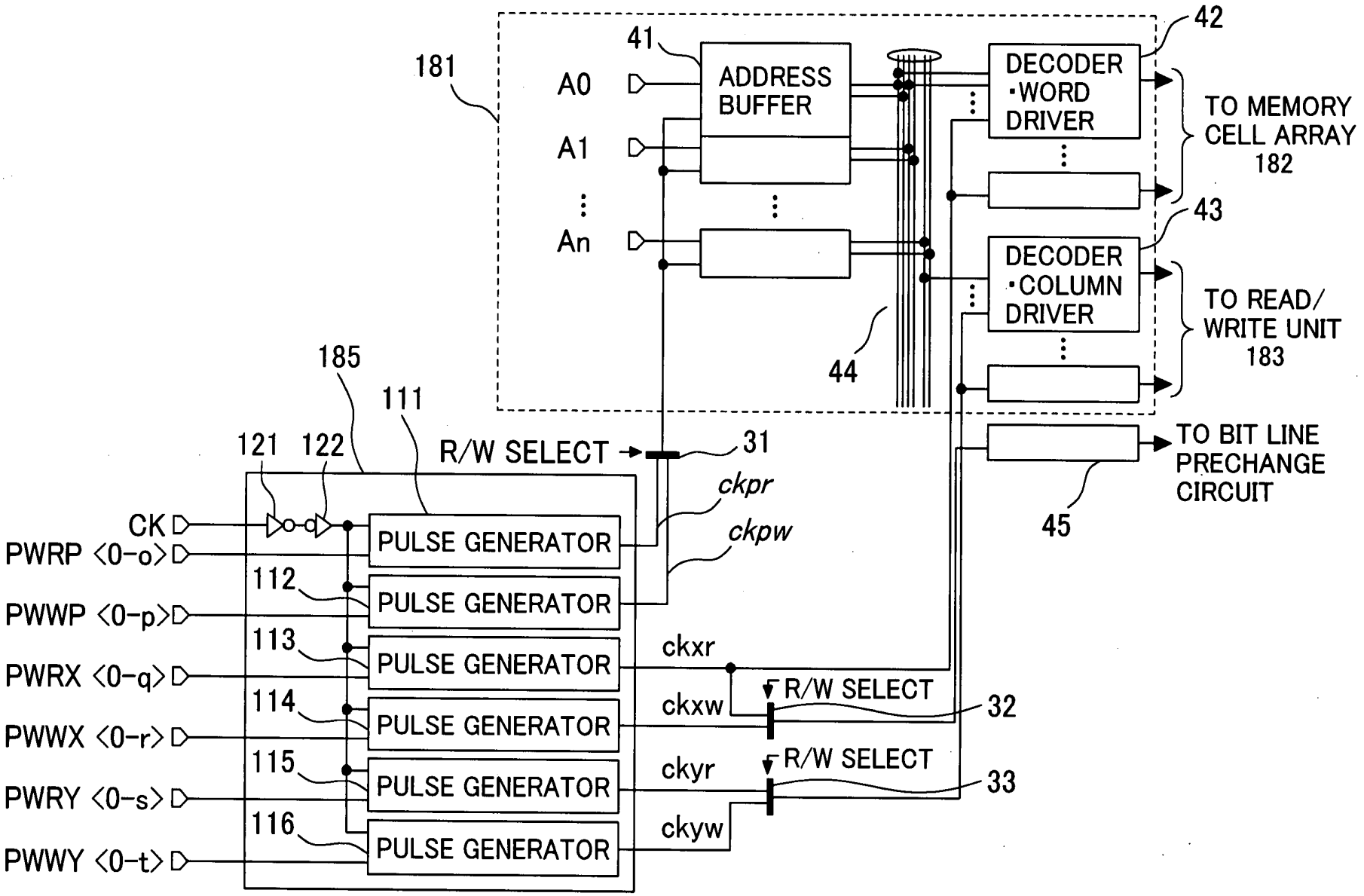

181
41
42
A0
A1
An
ADDRESS BUFFER
DECODER ·WORD DRIVER
TO MEMORY CELL ARRAY 182
43
DECODER ·COLUMN DRIVER
TO READ/ WRITE UNIT 183
44
185
111
121
122
R/W SELECT
31
ckpr
ckpw
TO BIT LINE PRECHANGE CIRCUIT
45
CK
PWRP <0-o>
PWWP <0-p>
PWRX <0-q>
PWWX <0-r>
PWRY <0-s>
PWWY <0-t>
112
113
114
115
116
PULSE GENERATOR
ckxr
ckxw
R/W SELECT
32
ckyr
R/W SELECT
33
ckyw

FIG.3A

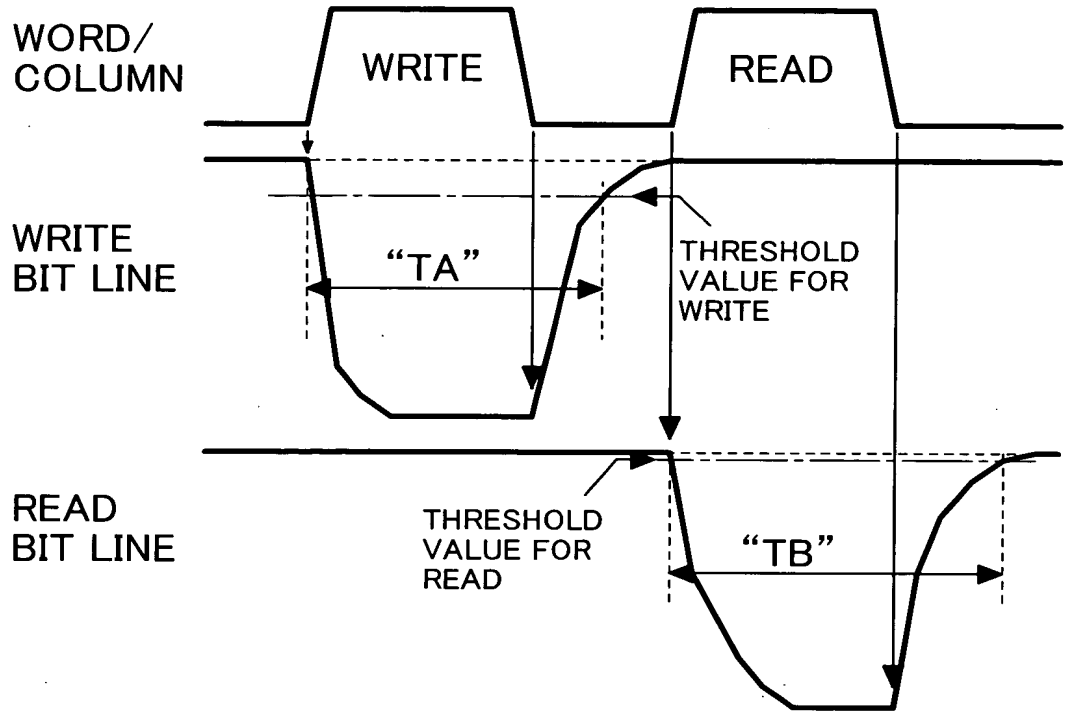

WORD/
COLUMN
WRITE
READ
WRITE
BIT LINE
"TA"
THRESHOLD
VALUE FOR
WRITE
READ
BIT LINE
THRESHOLD
VALUE FOR
READ
"TB"

FIG.3B

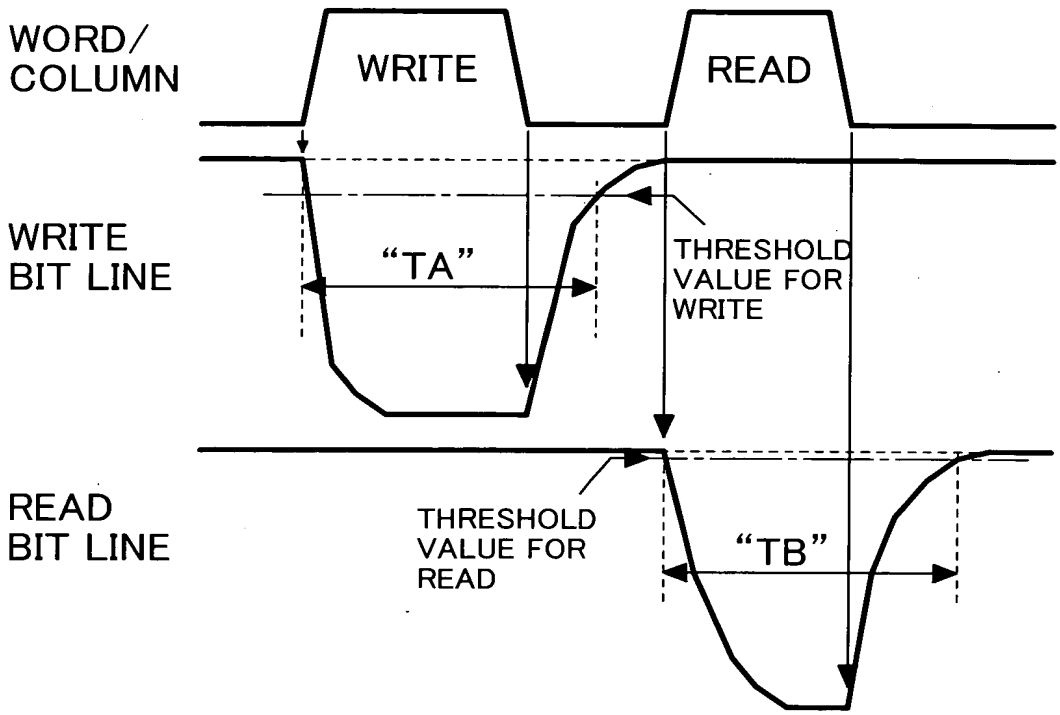

WORD/
COLUMN
WRITE
READ
WRITE
BIT LINE
"TA"
THRESHOLD
VALUE FOR
WRITE
READ
BIT LINE
THRESHOLD
VALUE FOR
READ
"TB"

FIG.4A

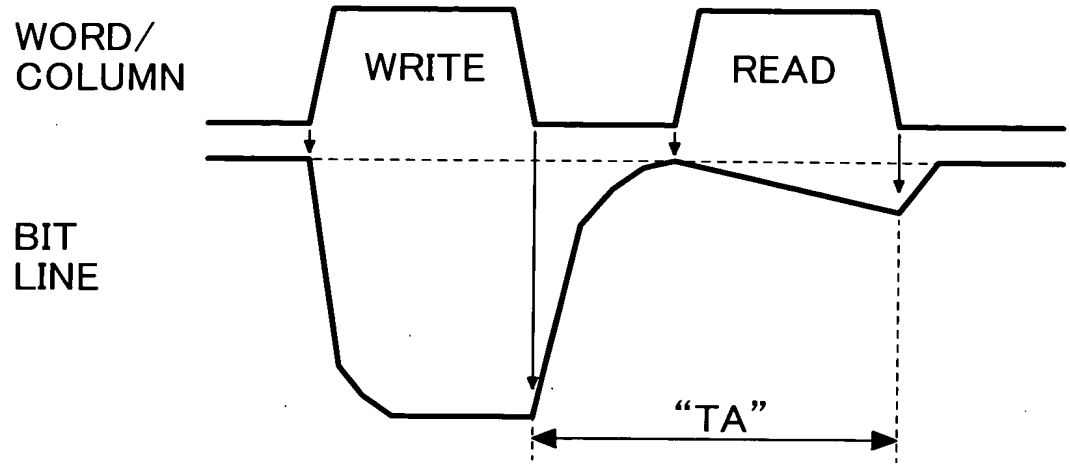


FIG.4B

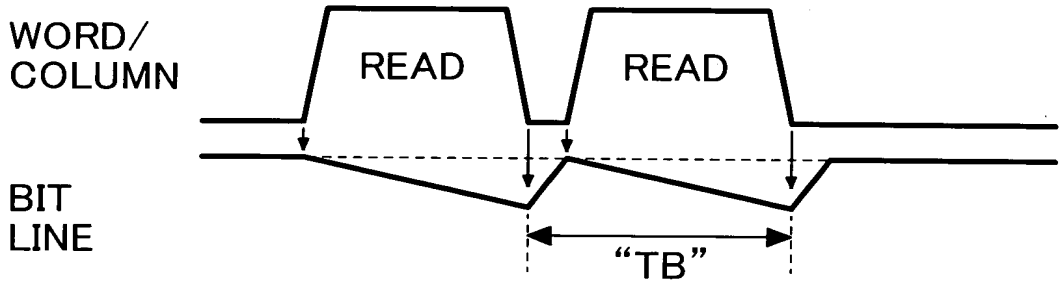


FIG.4C

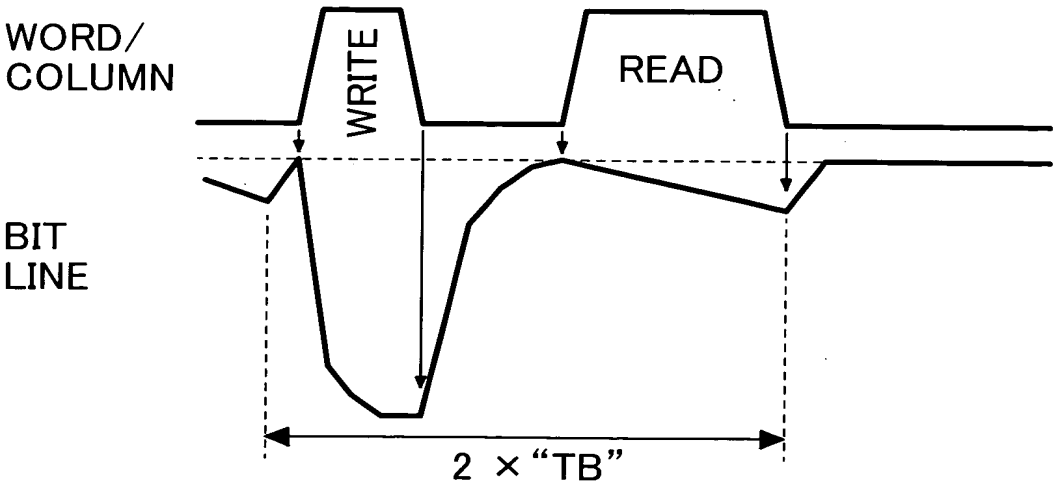


FIG.5

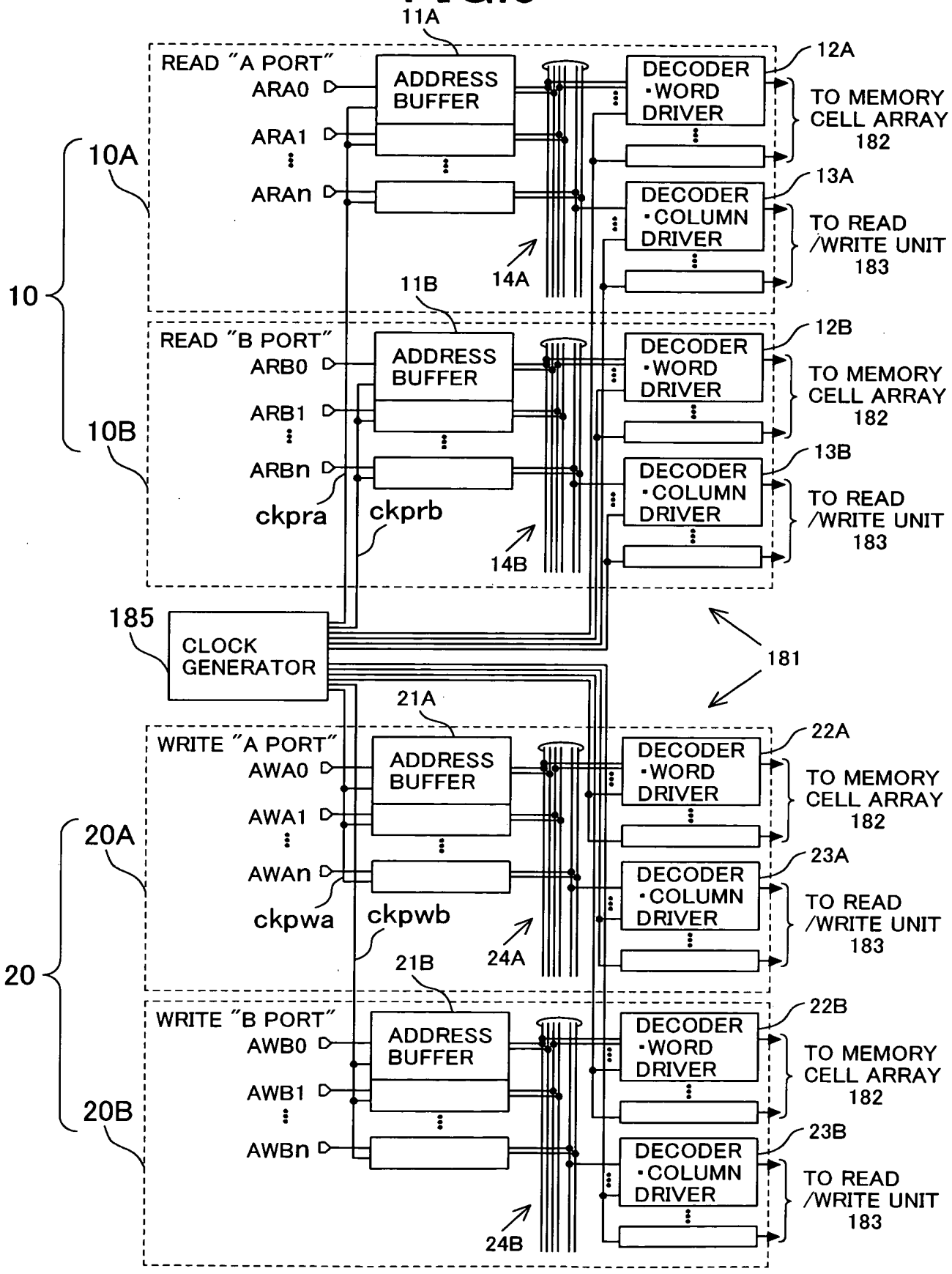

11A
READ "A PORT"
ARA0
ARA1
ARAn
ADDRESS BUFFER
DECODER ·WORD DRIVER
12A
TO MEMORY CELL ARRAY 182
10A
DECODER ·COLUMN DRIVER
13A
TO READ /WRITE UNIT 183
14A
10
11B
READ "B PORT"
ARB0
ARB1
ARBn
12B
13B
10B
ckpra
ckprb
14B
185
CLOCK GENERATOR
181
21A
WRITE "A PORT"
AWA0
AWA1
AWAn
22A
23A
20A
ckpwa
ckpwb
24A
20
21B
WRITE "B PORT"
AWB0
AWB1
AWBn
22B
23B
20B
24B

FIG.6A

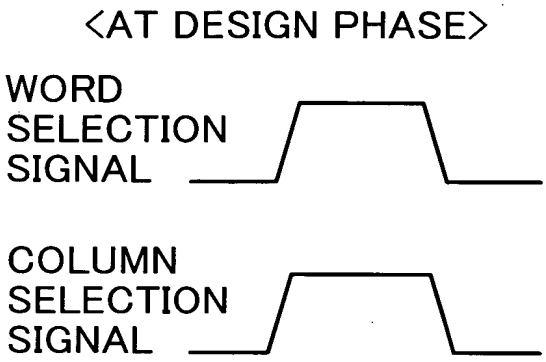


FIG.6B

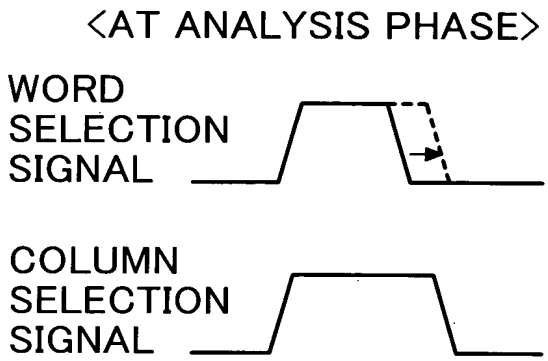


FIG.6C

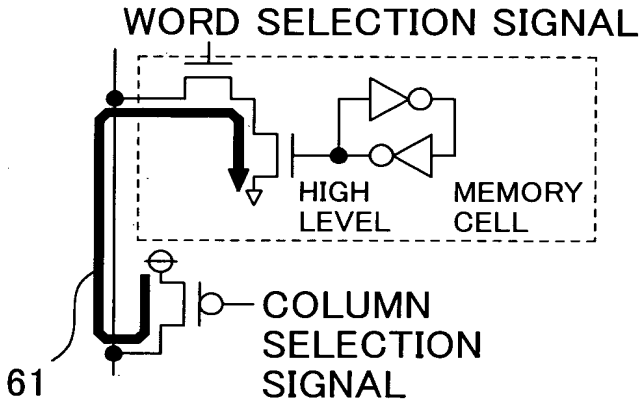


FIG.6D

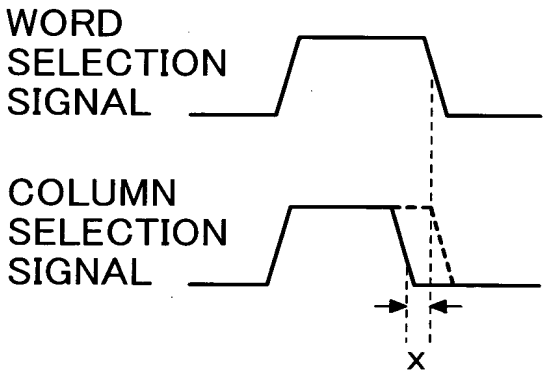


FIG.7

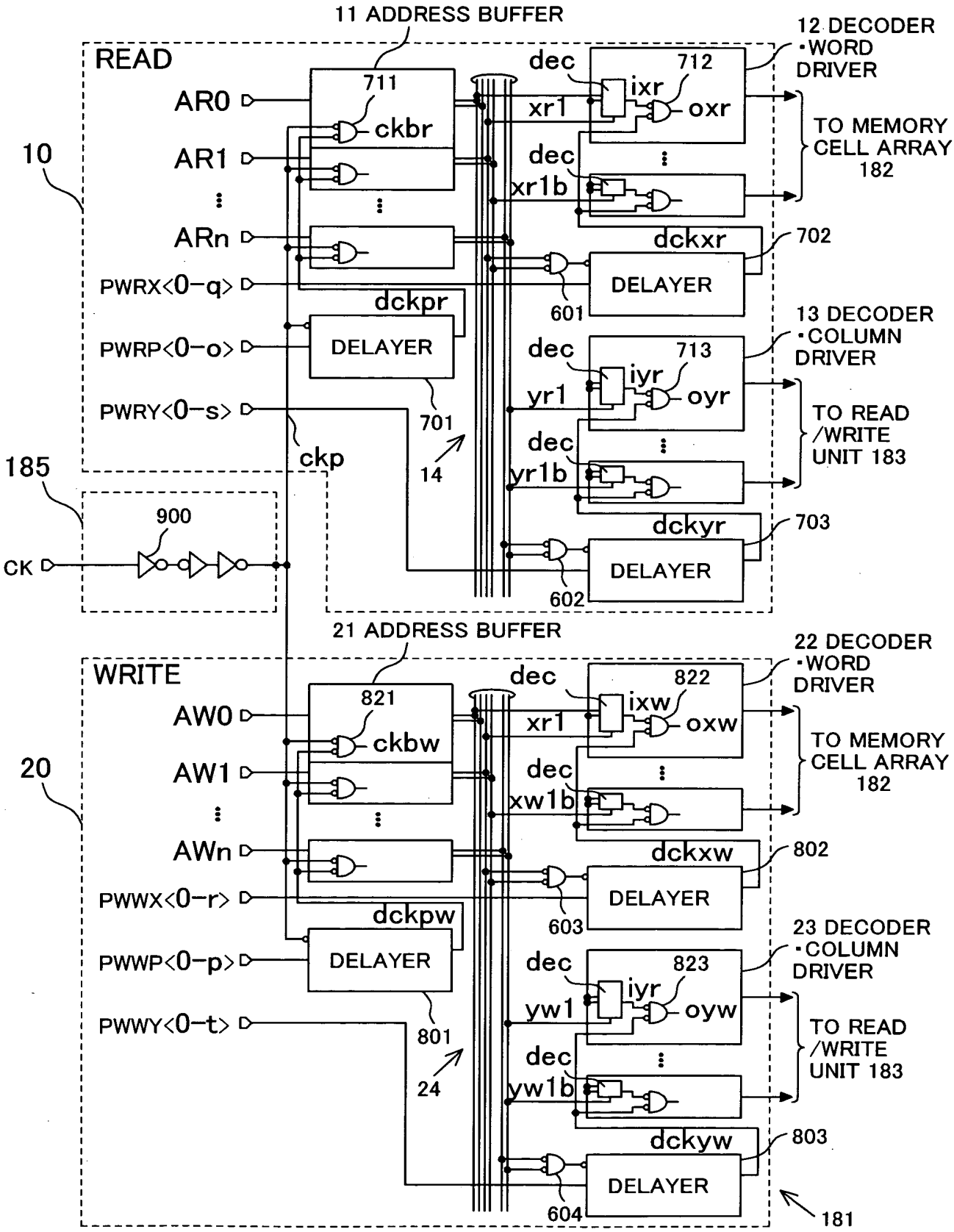

11 ADDRESS BUFFER
READ
AR0
AR1
ARn
PWRX<0-q>
PWRP<0-o>
PWRY<0-s>
711
ckbr
dckpr
DELAYER
701
ckp
14
10
185
900
CK
dec
xr1
xr1b
712
ixr
oxr
dckxr
DELAYER
601
702
12 DECODER
·WORD
DRIVER
TO MEMORY
CELL ARRAY
182
dec
yr1
yr1b
713
iyr
oyr
dckyr
DELAYER
602
703
13 DECODER
·COLUMN
DRIVER
TO READ
/WRITE
UNIT 183
21 ADDRESS BUFFER
WRITE
AW0
AW1
AWn
PWWX<0-r>
PWWP<0-p>
PWWY<0-t>
821
ckbw
dckpw
DELAYER
801
24
20
dec
xr1
xw1b
822
ixw
oxw
dckxw
DELAYER
603
802
22 DECODER
·WORD
DRIVER
TO MEMORY
CELL ARRAY
182
dec
yw1
yw1b
823
iyr
oyw
dckyw
DELAYER
604
803
23 DECODER
·COLUMN
DRIVER
TO READ
/WRITE
UNIT 183
181

FIG.8

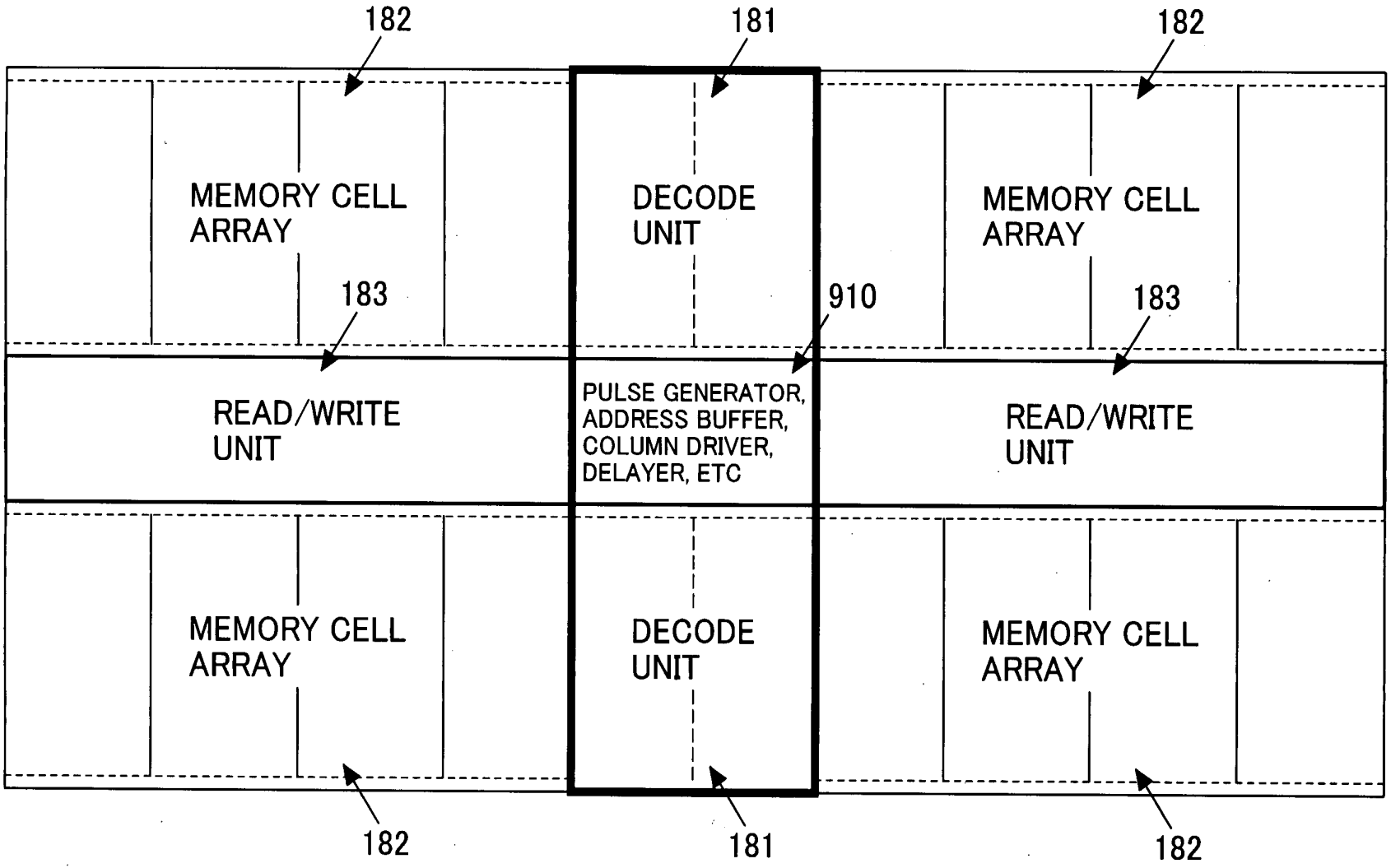

182
181
182
MEMORY CELL ARRAY
DECODE UNIT
MEMORY CELL ARRAY
183
910
183
READ/WRITE UNIT
PULSE GENERATOR, ADDRESS BUFFER, COLUMN DRIVER, DELAYER, ETC
READ/WRITE UNIT
MEMORY CELL ARRAY
DECODE UNIT
MEMORY CELL ARRAY
182
181
182

FIG.9

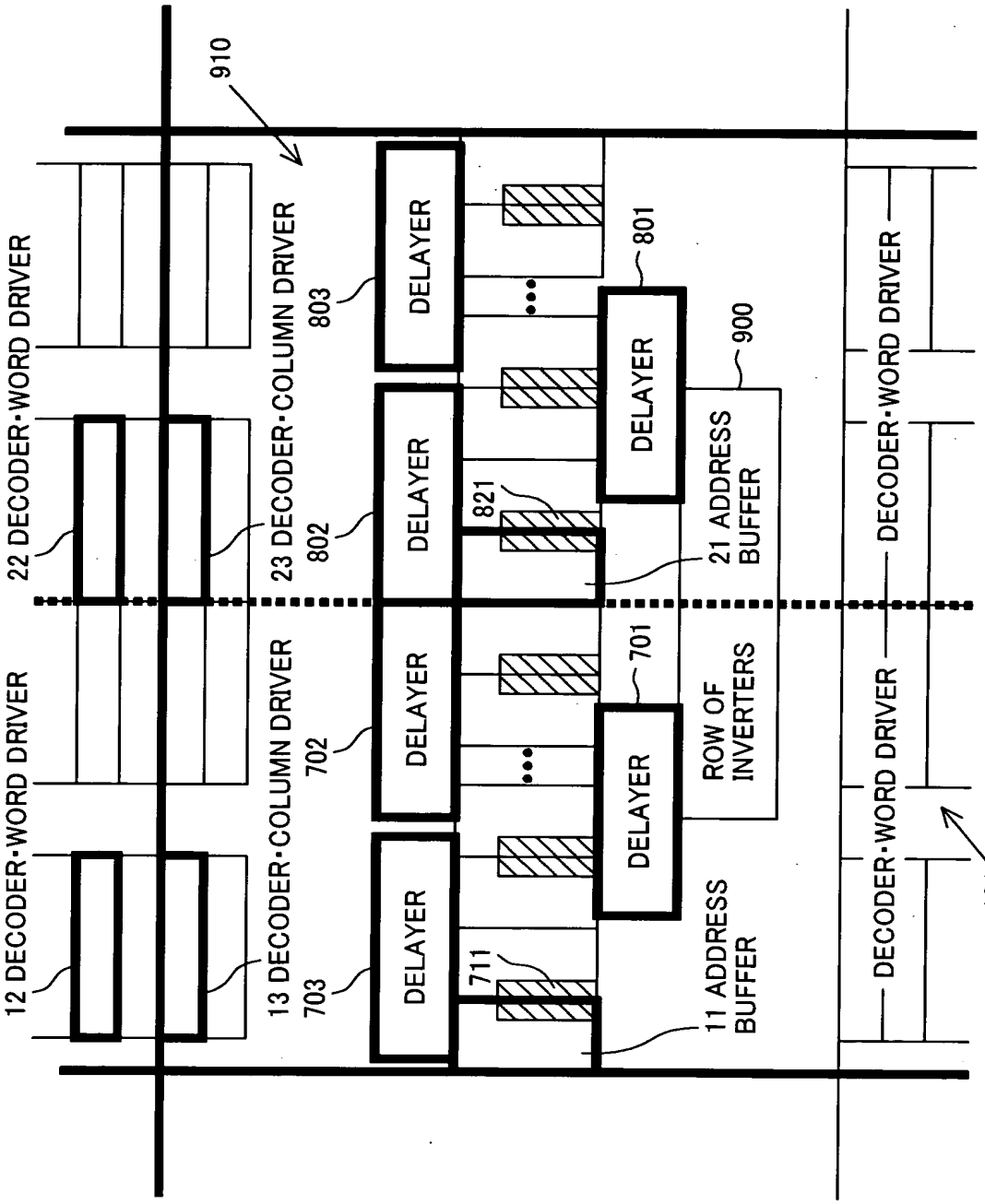

910
12 DECODER·WORD DRIVER
22 DECODER·WORD DRIVER
13 DECODER·COLUMN DRIVER
703
DELAYER
702
DELAYER
23 DECODER·COLUMN DRIVER
802
DELAYER
803
DELAYER
711
821
701
DELAYER
801
DELAYER
ROW OF INVERTERS
900
11 ADDRESS BUFFER
21 ADDRESS BUFFER
DECODER·WORD DRIVER
DECODER·WORD DRIVER
181

FIG.10

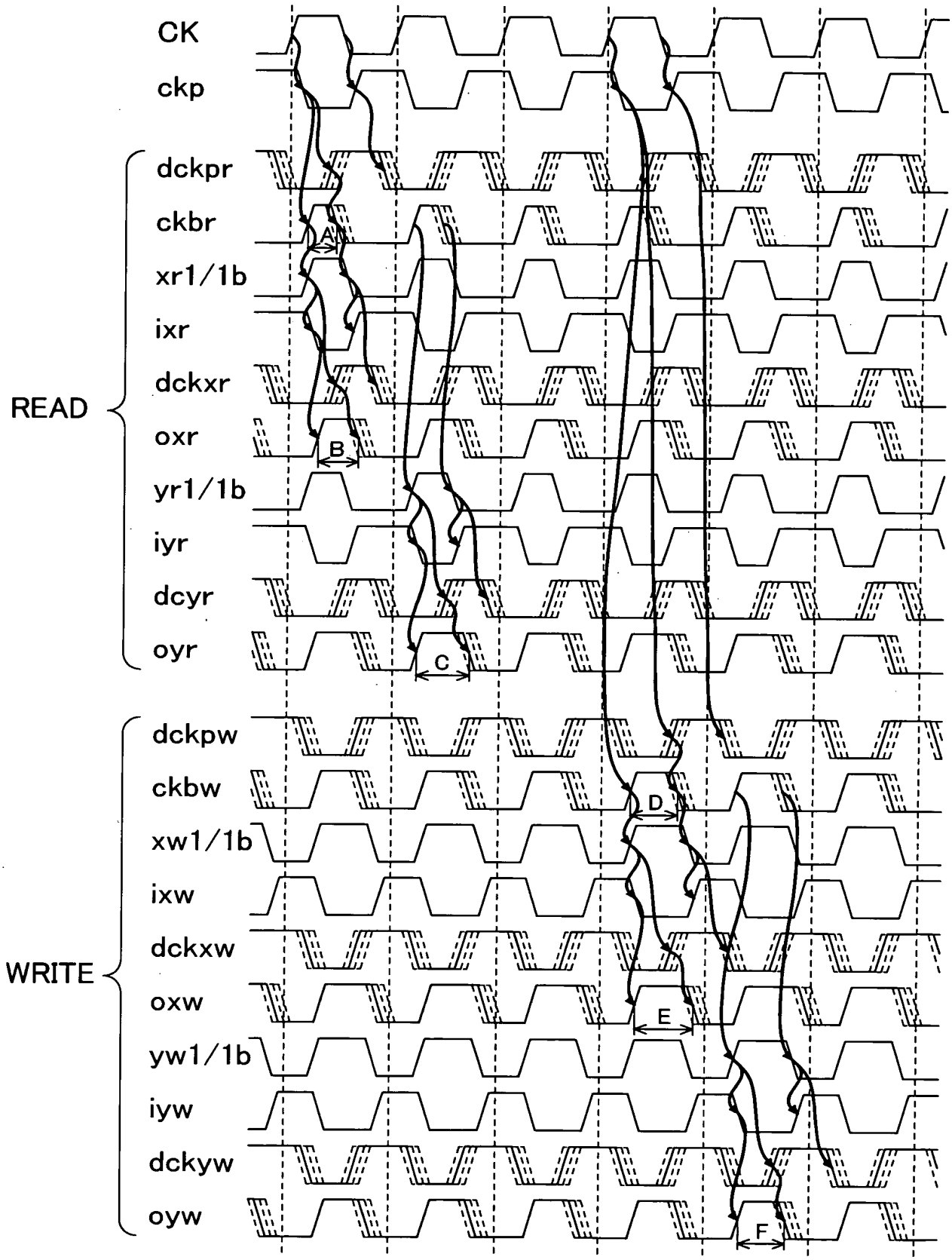

CK
ckp
READ
dckpr
ckbr
xr1/1b
ixr
dckxr
oxr
yr1/1b
iyr
dcyr
oyr
WRITE
dckpw
ckbw
xw1/1b
ixw
dckxw
oxw
yw1/1b
iyw
dckyw
oyw
A
B
C
D
E
F

FIG.11

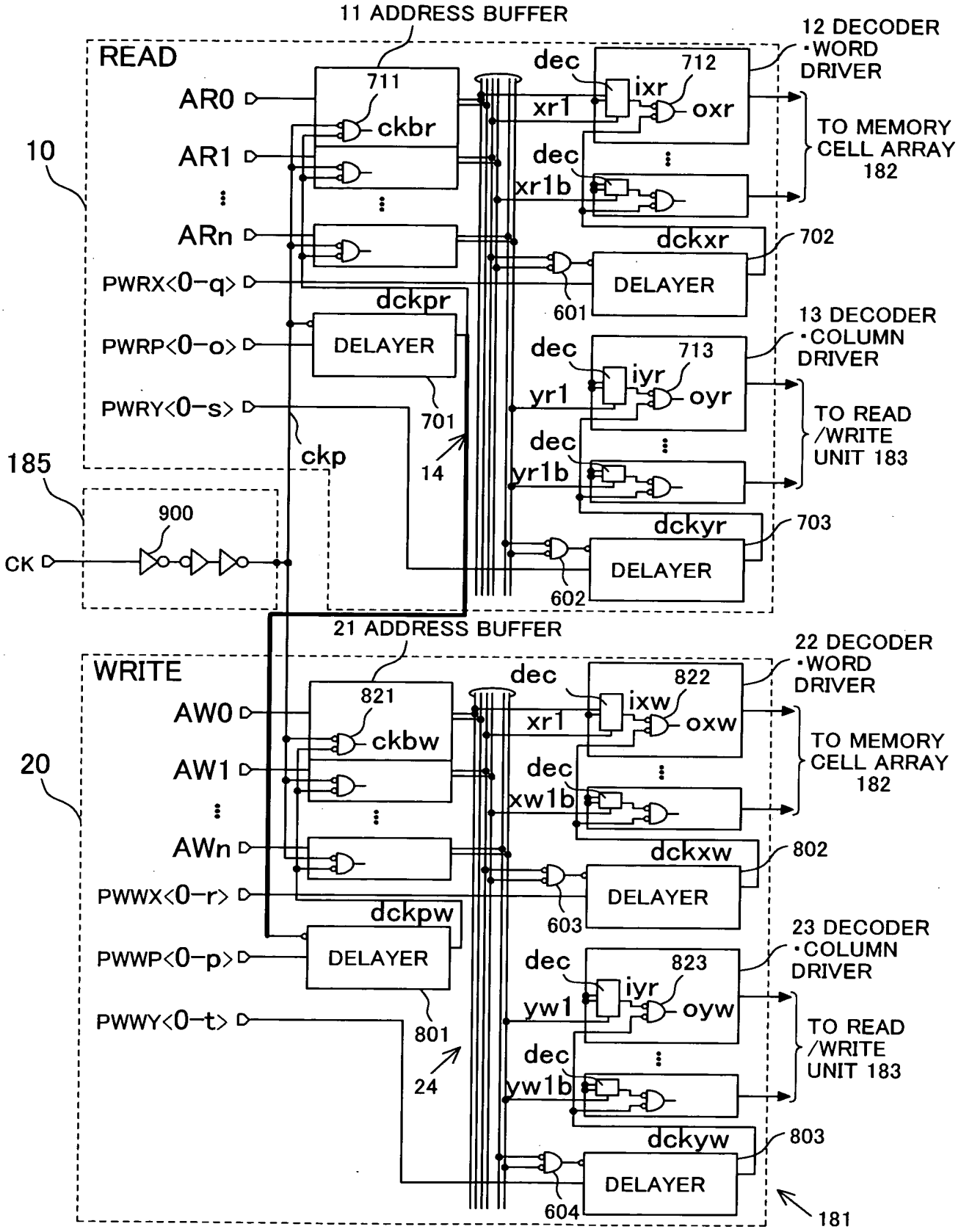

11 ADDRESS BUFFER
READ
AR0
AR1
ARn
PWRX<0-q>
PWRP<0-o>
PWRY<0-s>
CK
711
ckbr
ckp
dckpr
DELAYER
701
14
185
900
10
dec
712
ixr
oxr
xr1
xr1b
TO MEMORY CELL ARRAY 182
dckxr
DELAYER
702
601
12 DECODER ·WORD DRIVER
13 DECODER ·COLUMN DRIVER
713
iyr
oyr
yr1
yr1b
TO READ /WRITE UNIT 183
dckyr
DELAYER
703
602
21 ADDRESS BUFFER
WRITE
AW0
AW1
AWn
PWWX<0-r>
PWWP<0-p>
PWWY<0-t>
821
ckbw
dckpw
DELAYER
801
24
20
822
ixw
oxw
xw1b
TO MEMORY CELL ARRAY 182
dckxw
DELAYER
802
603
22 DECODER ·WORD DRIVER
823
iyr
oyw
yw1
yw1b
TO READ /WRITE UNIT 183
dckyw
DELAYER
803
604
23 DECODER ·COLUMN DRIVER
181

FIG.12

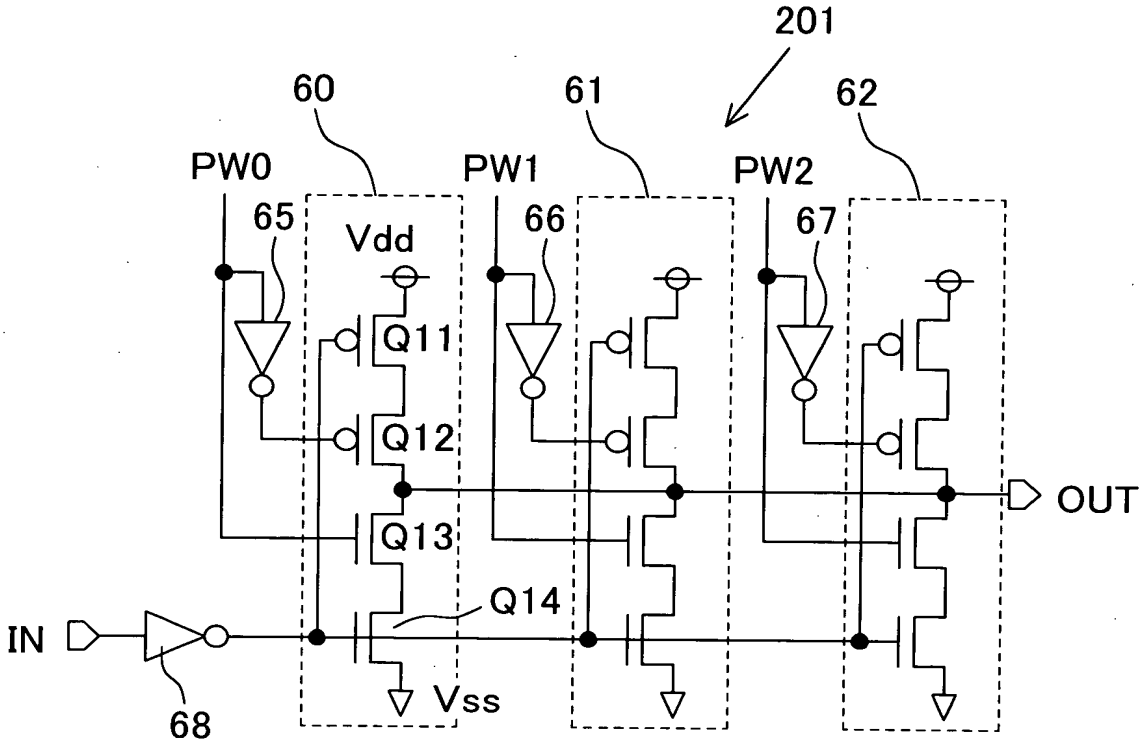


FIG.13

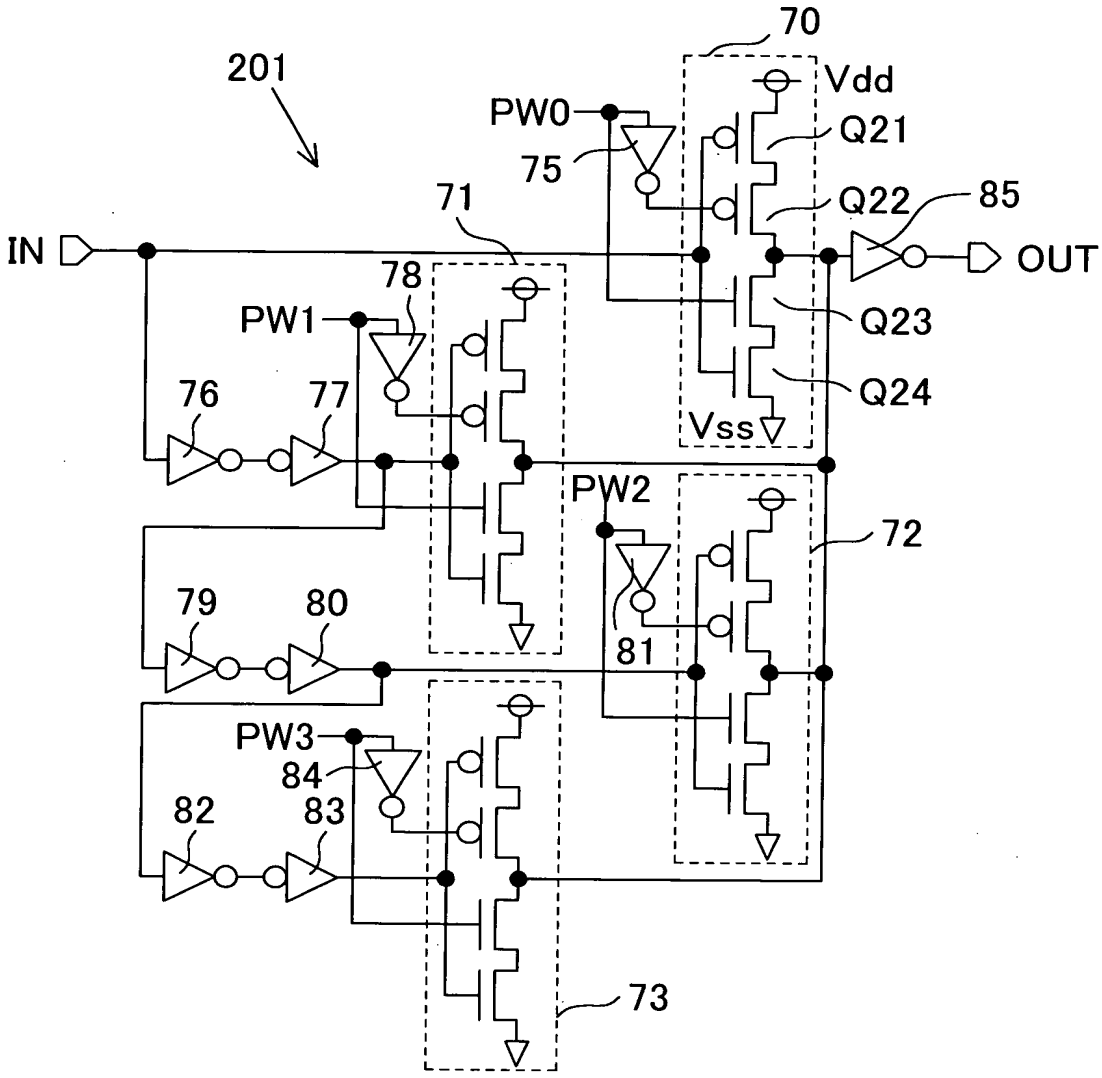

201
70
Vdd
PW0
Q21
75
Q22
85
71
IN
OUT
78
PW1
Q23
Q24
76
77
Vss
PW2
72
79
80
81
PW3
84
82
83
73

FIG.14

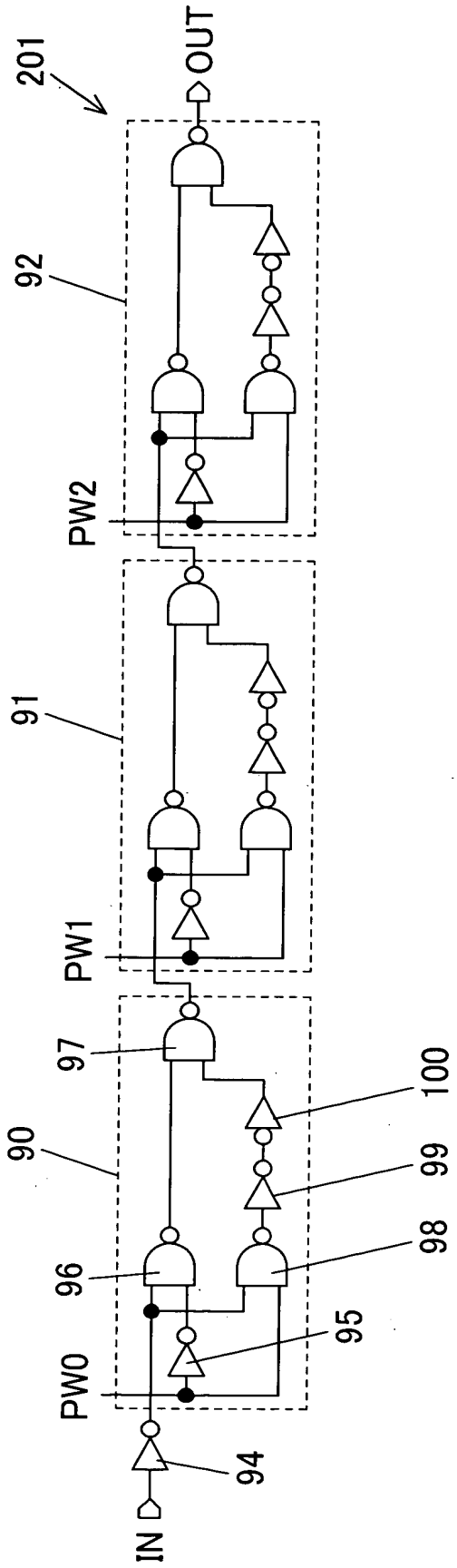


FIG.15

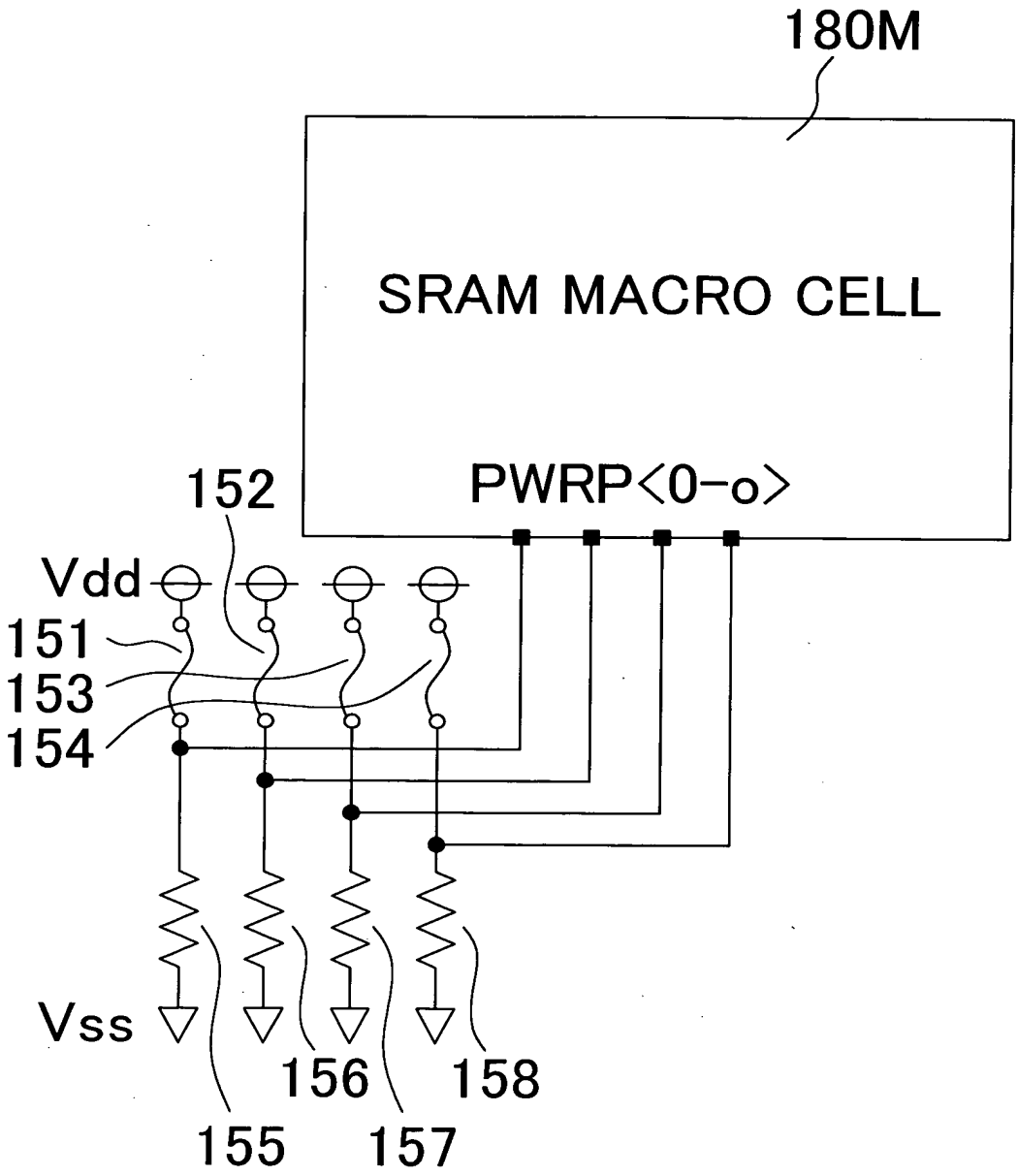

180M
SRAM MACRO CELL
PWRP<0-o>
152
Vdd
151
153
154
Vss
155
156
157
158

FIG.16

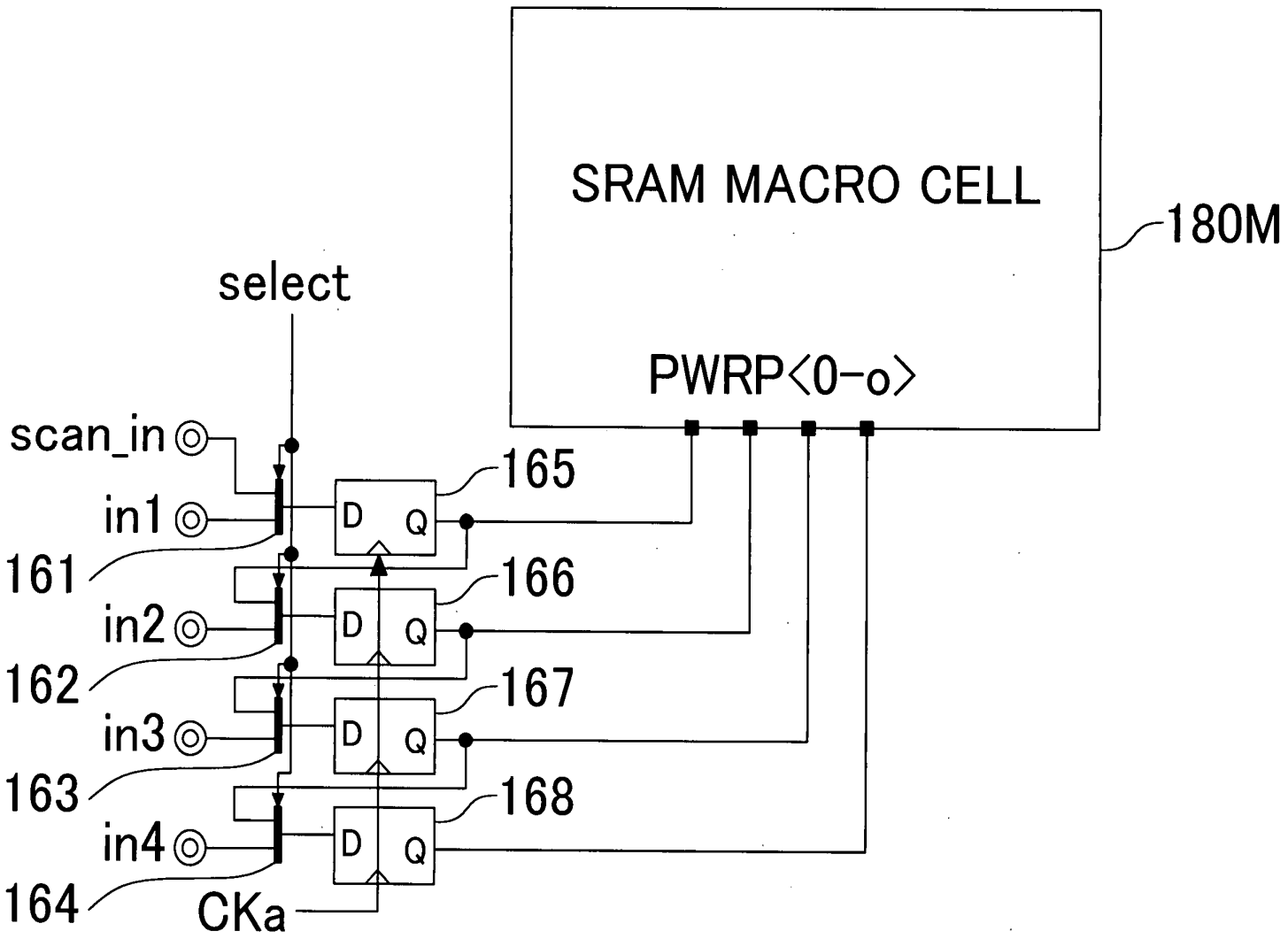

SRAM MACRO CELL
180M
PWRP<0-o>
select
scan_in
in1
161
in2
162
in3
163
in4
164
CKa
165
166
167
168
D
Q

FIG.17

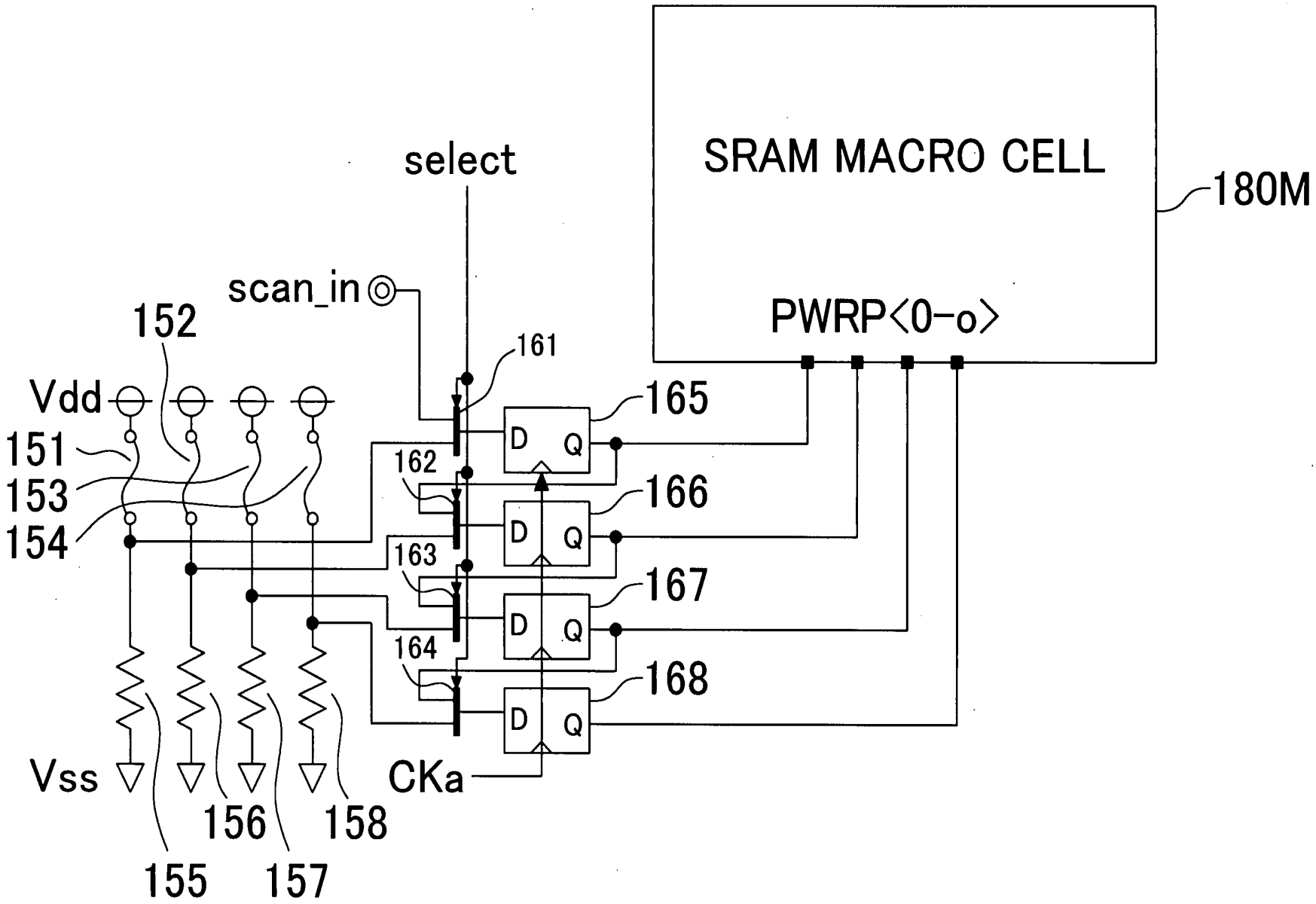

SRAM MACRO CELL
180M
select
scan_in
PWRP<0-o>
152
161
Vdd
151
153
154
165
162
166
163
167
164
168
D
Q
Vss
CKa
156
158
155
157

FIG.18

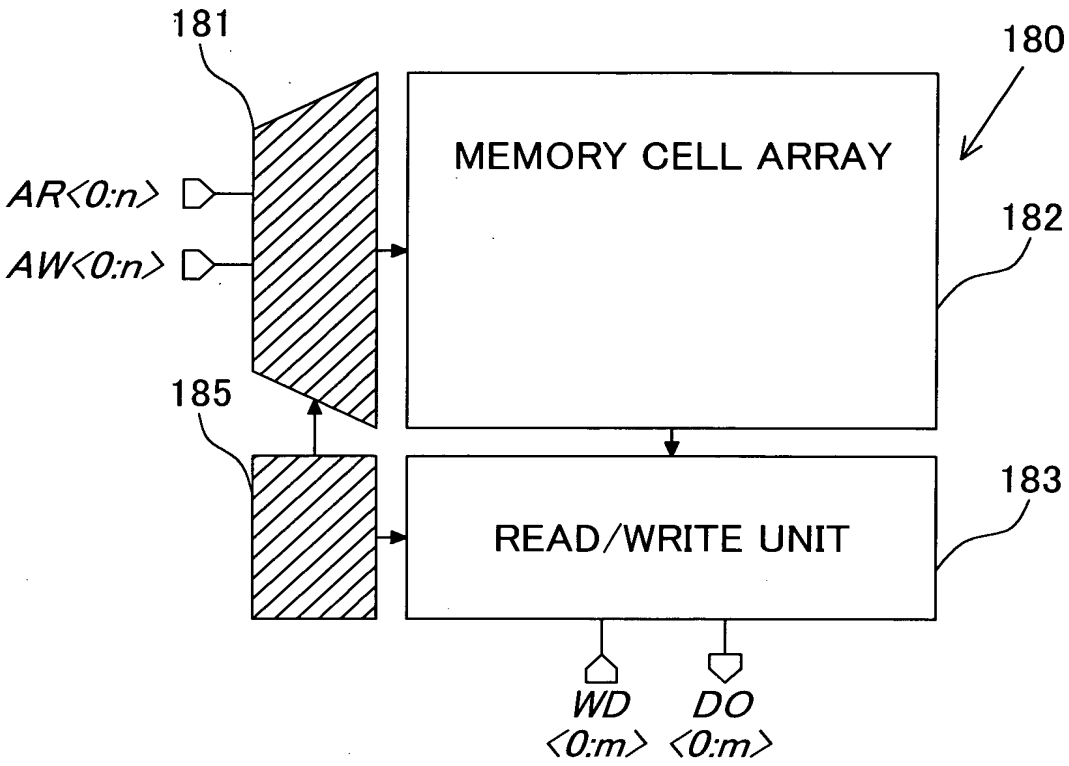

181
180
MEMORY CELL ARRAY
AR<0:n>
AW<0:n>
182
185
183
READ/WRITE UNIT
WD
<0:m>
DO
<0:m>

FIG.19

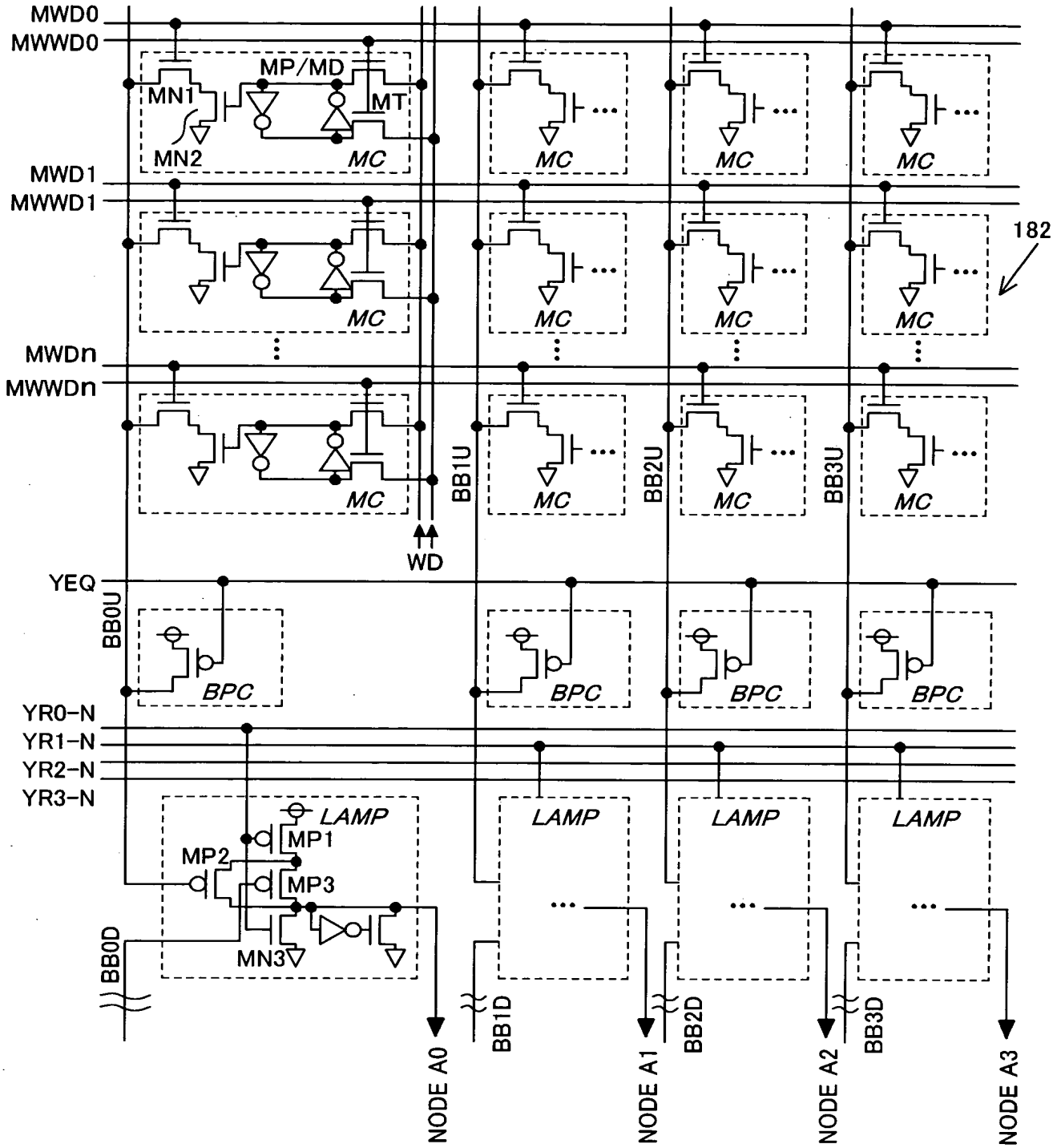

MWD0
MWWD0
MP/MD
MN1
MT
MN2
MC
MWD1
MWWD1
182
MWDn
MWWDn
BB1U
BB2U
BB3U
WD
YEQ
BB0U
BPC
YR0-N
YR1-N
YR2-N
YR3-N
LAMP
MP1
MP2
MP3
MN3
BB0D
BB1D
BB2D
BB3D
NODE A0
NODE A1
NODE A2
NODE A3

FIG.20

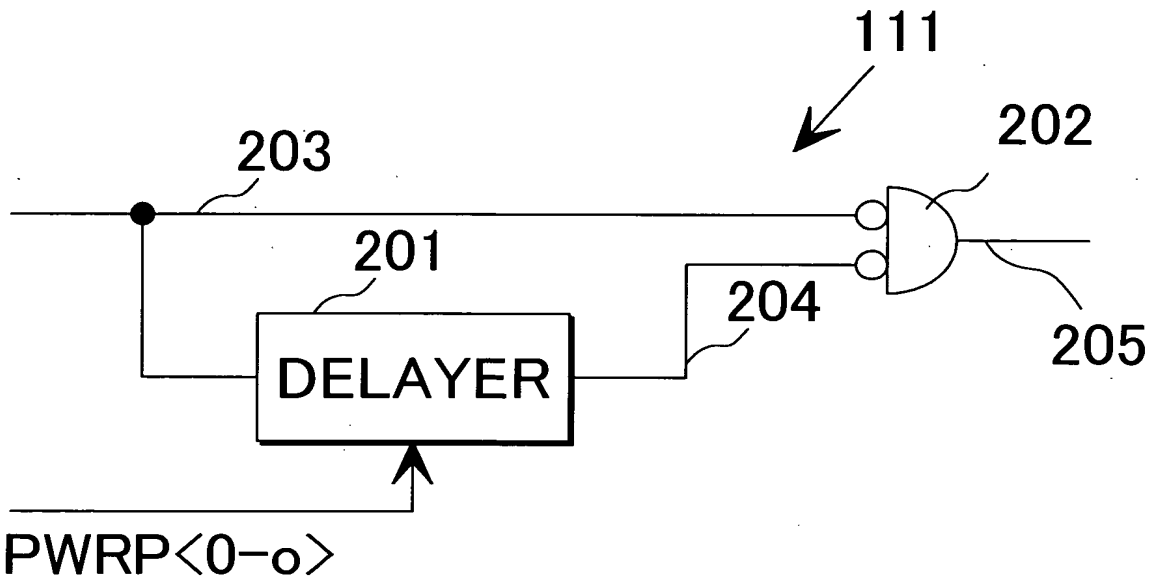


FIG.21

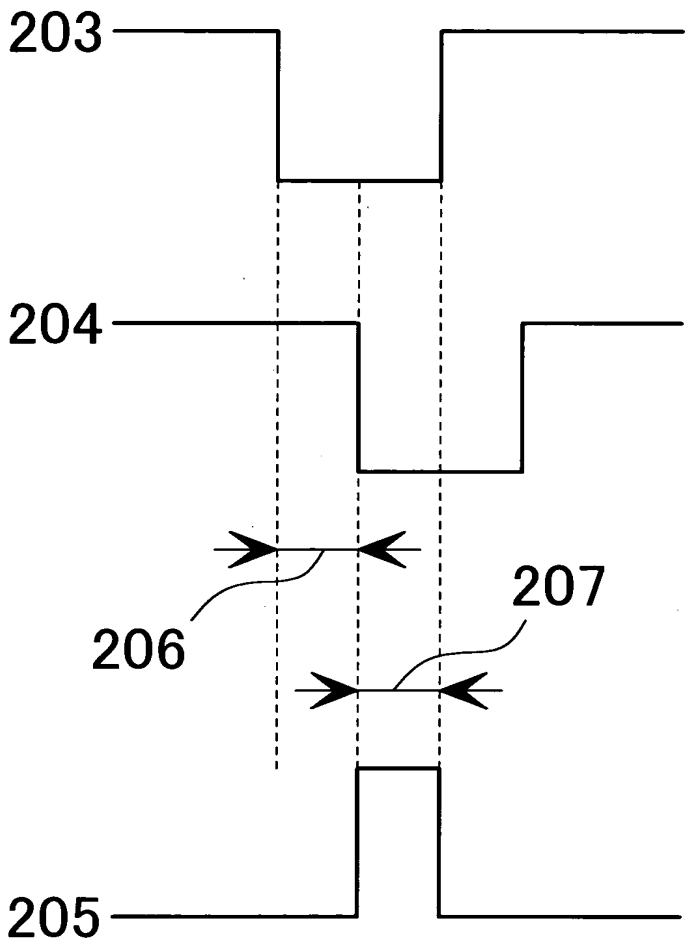


FIG.22

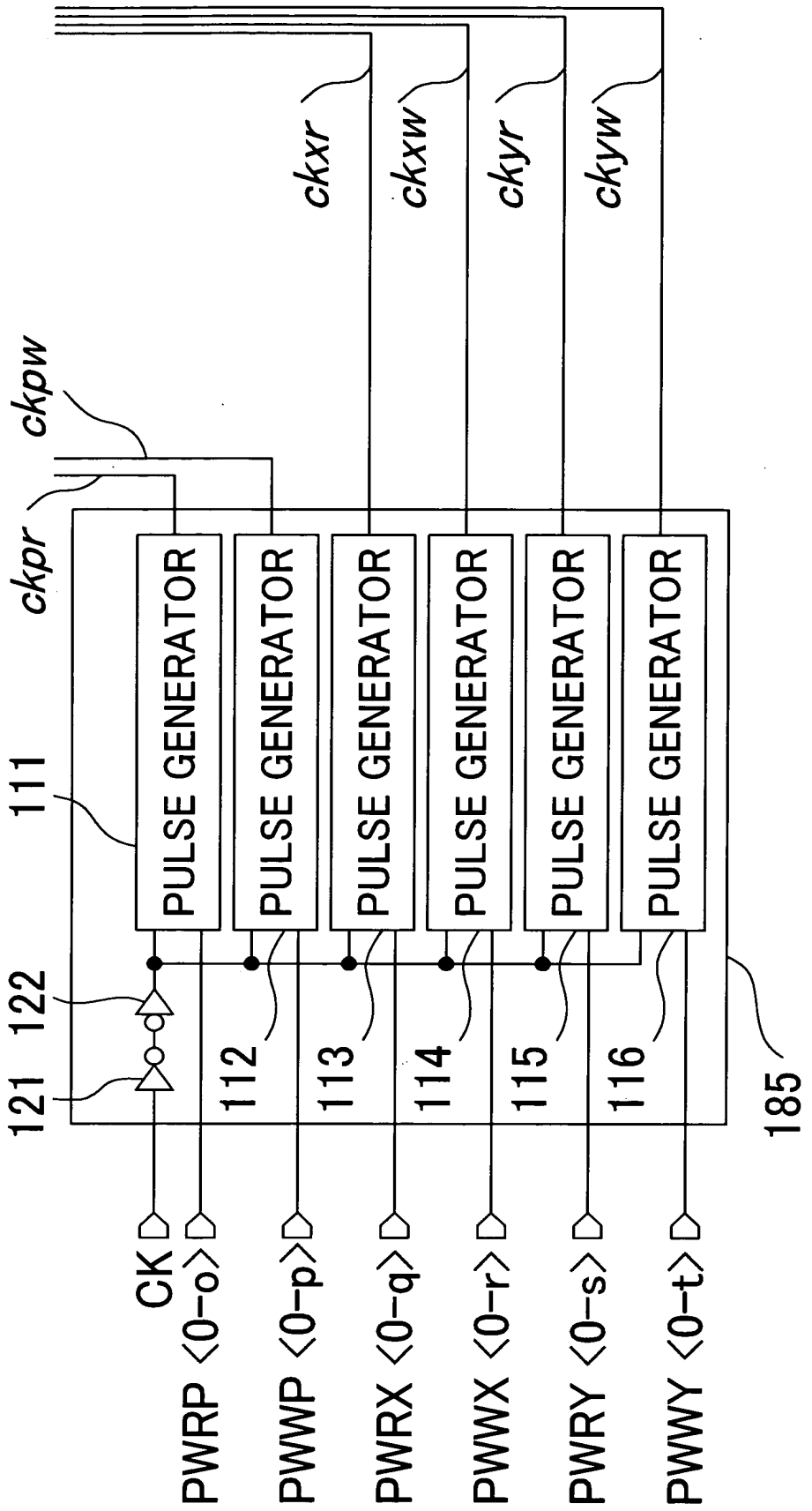
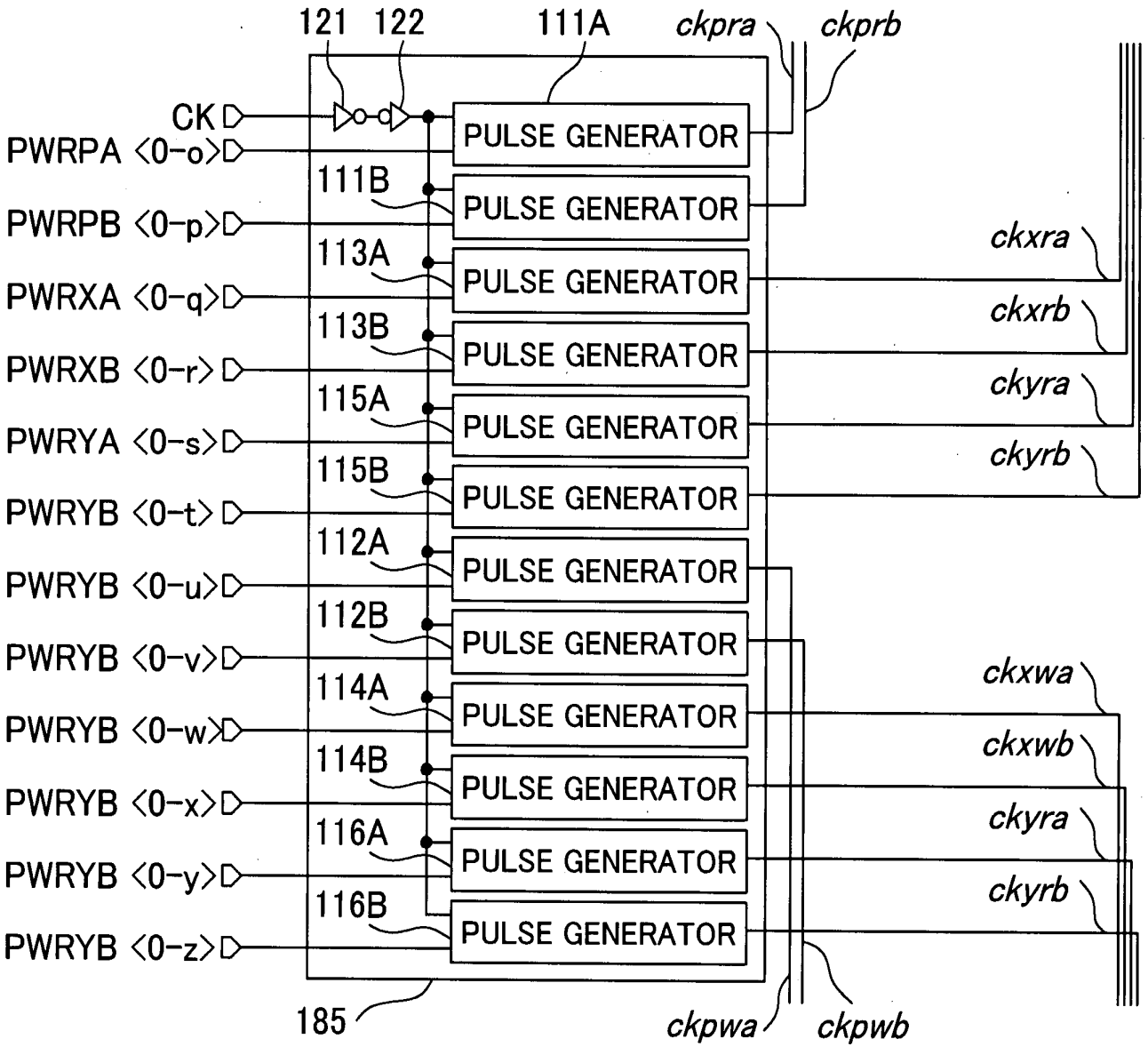

ckxr
ckxw
ckyr
ckyw
ckpw
ckpr
111
PULSE GENERATOR
PULSE GENERATOR
PULSE GENERATOR
PULSE GENERATOR
PULSE GENERATOR
PULSE GENERATOR
122
121
112
113
114
115
116
185
CK
PWRP <0-o>
PWWP <0-p>
PWRX <0-q>
PWWX <0-r>
PWRY <0-s>
PWWY <0-t>

FIG.23


111
121
122
111A
ckpra
ckprb
CK
PWRPA <0-o>
PWRPB <0-p>
PWRXA <0-q>
PWRXB <0-r>
PWRYA <0-s>
PWRYB <0-t>
PWRYB <0-u>
PWRYB <0-v>
PWRYB <0-w>
PWRYB <0-x>
PWRYB <0-y>
PWRYB <0-z>
111B
113A
113B
115A
115B
112A
112B
114A
114B
116A
116B
PULSE GENERATOR
ckxra
ckxrb
ckyra
ckyrb
ckxwa
ckxwb
ckyra
ckyrb
185
ckpwa
ckpwb